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Department of Energy

Richland Operations Office
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07-AMCP-0121

MAR 15 2007

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Blvd., Suite 115
Richland, Washington 99352

Dear Mr. Ceto:

ADDENDUM TO THE 200-TW-1/2 AND 200-PW-5 OPERABLE UNIT GROUP WORKPLAN (DOE/RL-2000-38) FOR A TREATABILITY TEST AT THE 200 BC CRIBS AND TRENCHES AREA, REVISION 0

The purpose of this letter is to respond to the January 25, 2007, response to the Draft Remedial Investigation/Feasibility Study Workplan Addendum for the BC Cribs and Trenches Area Treatability Test. The U.S. Department of Energy, Richland Operations Office is transmitting the Addendum to the 200-TW-1/2 and 200-PW-5 Operable unit group Workplan (DOE/RL-2000-38) for a Treatability Test at the 200 BC Cribs and Trenches Area, Revision 0 for your approval. 0054785

Thank you for your cooperation and assistance in addressing the comments provided on Draft A. The attached addendum reflects the accepted comment resolution necessary to gain your approval per discussion with Rod Lobos, of your staff. If you have any questions, please contact me, or your staff may contact, Briant Charboneau, on (509) 373-6137.

Sincerely,

Matthew S. McCormick, Assistant Manager
for the Central Plateau

AMCP:BLF

Attachment

cc w/attach:
R. A. Lobos, EPA
J. B. Price, Ecology
~~Administrative Record~~ 200-PW-5
Environmental Portal

cc w/o attach:
C. E. Cameron, EPA
R. E. Piippo, FHI
J. G. Vance, FFS

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ADDENDUM

BC CRIBS AND TRENCHES AREA TREATABILITY TEST

CONTENTS

FIGURES

TABLES

TERMS

ALARA	as low as reasonably achievable
DOE	U.S. Department of Energy
DPT	direct-push technology
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
RL	DOE Richland Operations Office
SGL	spectral-gamma logging

ADDENDUM

BC CRIBS AND TRENCHES AREA TREATABILITY TEST

ADD-1.0 INTRODUCTION

A treatability test will be performed to support remedy selection at the BC Cribs and Trenches Area waste sites. Risk (DOE/RL-2004-66) from these waste sites primarily is associated with the cribs and trenches that received scavenged waste and results from two sources:

1. High concentrations (> 1 million pCi/g) of Cs-137 and Sr-90, located approximately 3.66 m (12 ft) below ground surface, representing potential human health and ecological risk, as well as inadvertent intruder risk
2. High concentrations of nitrate and Tc-99, located approximately 30 to 38 m (100 to 125 ft) below ground surface, representing potential groundwater threat.

This treatability test is focused on the near-surface Cs-137 and Sr-90 contamination. The emphasis is on reducing uncertainties regarding its nature and extent and on related estimates of remediation-worker dose and cost.

ADD-2.0 BACKGROUND

A U.S. Environmental Protection Agency (EPA) review of the focused feasibility study (FFS) for the BC Cribs and Trenches Area waste sites (DOE/RL-2004-66, Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites) concluded that partial excavation with capping is the proper remedy for the majority of the BC Cribs and Trenches Area waste sites (EPA, 2005, "Transmittal of EPA Comments to Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites, DOE/RL-2004-66, Draft A, and the Proposed Plan for the BC Cribs and Trenches Area Waste Sites, DOE/RL-2004-69, Draft A"). The EPA conclusion was in response to the RL-prepared FFS that recommended capping for the majority of the waste sites to provide groundwater protection, with the risk from the relatively short-lived near-surface contamination being mitigated by the institutional controls associated with ensuring cap integrity. The EPA, reluctant to rely on institutional controls when active remedies can be employed, recommended excavation of the near-surface contamination and then capping (i.e., partial excavation with capping), to protect groundwater from the deep mobile contamination. The purpose of this treatability test is to collect additional information to resolve uncertainty regarding the nature and extent of near-surface contamination and its impact on worker dose and cost estimates.

Justification for final remedy selection will be strengthened by reducing uncertainty regarding the nature and extent of near-surface contamination and its impact on worker dose and cost estimates for excavation of that contamination. Appendix F of the focused feasibility study (DOE/RL-2004-66) evaluated spectral-gamma logging (SGL) data obtained from the six shallow drive-casing holes placed in the 216-B-26 Trench for the purpose of locating the deep borehole used to collect soil samples. Because of the variability in contamination observed along the length of the trench, it was concluded that considerable uncertainty existed in the source term used for the worker dose-estimate calculations. Additional uncertainty resulted from attempting to correlate soil-sampling data to the SGL data.

These same source-term uncertainties translate to uncertainties in the cost estimate. The cost estimate to excavate the near-surface contamination for the partial excavation with capping remedy assumed that half of each trench that received scavenged waste would require extensive soil downblending to meet the Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria and transportation requirements (e.g., allowable container dose rate).

Another area of uncertainty, related only to the cribs, is whether remnant crib structures could contribute to future subsidence - this is an important consideration for long-term cap effectiveness, because cap subsidence could impact cap performance. Subsidence was recorded at the 216-B-18 Crib in 1974 when a hole approximately 1.2 m (4 ft) deep and 2.1 m (7 ft) in diameter was observed (ARH-3046, Engineering Evaluation Waste Disposal Cribs - 200 Area).

Finally, the potential for high concentrations of transuranic constituents (plutonium) at the 216-B-53A Trench presents uncertainty regarding excavation there. At one time, this trench was believed likely to possess transuranic constituent contamination at concentrations exceeding 100 nCi/g. Although a recent update halves this estimate (RPP-26744, Hanford Soil Inventory Model, Revision 1) and other characterization data suggest that this quantity may not be significant, the uncertainty regarding this contamination needs to be resolved. Also, because the 216-B-53A trench waste stream differs from the other BC Cribs and Trenches Area waste sites (i.e., it received liquid waste from the PRTR test reactor upset whereas the other sites received either scavenged waste or laboratory waste), its conceptual site model (CSM) is uncertain. The treatability test will provide information to refine the CSM.

ADD-3.0 OBJECTIVES

Following are the specific objectives of the treatability study.

- Obtain additional characterization data for the BC Cribs and Trenches Area waste sites to evaluate the remedial action alternative that includes removal, treatment, and disposal of highly contaminated near-surface soil.
- Obtain data to refine cost estimates for excavation and disposal of contaminated near-surface soil.
- Correlate predicted dose information (obtained by modeling worker exposure using pre-excavation site characterization data) to actual dose received during conduct of the treatability study.
- Refine the removal, treatment, and disposal process to ensure that the dose to workers remains as low as reasonably achievable (ALARA).
- Evaluate the potential for future subsidence of the remnant crib structure.

- Evaluate the potential for the plutonium inventory associated with the 216-B-53A Trench to require special handling/disposal procedures.
- Refine the conceptual site model for the 216-B-53A Trench.

A formal data quality objectives (DQO) process will be undertaken to review background data, formulate principal study questions, and define what data need to be collected to answer the questions. These questions will be derived from the objectives stated above. The purpose of the DQO process is to focus the investigation to ensure that the proper data are collected. Once the principal study questions are formulated, design of the treatability test is readily established via the DQO process. From the DQO process, a sampling and analysis plan will be prepared that directs specific data-collection activities. The data collection is designed to allow the principal study questions to be answered. Finally, the DQO and sampling and analysis plan will be incorporated into a treatability test plan that also will include a health and safety plan, schedule, waste control plan, and an air monitoring plan.

ADD-4.0 ANTICIPATED TREATABILITY TEST DESIGN

The treatability test will be conducted to include specific elements designed to enhance understanding of the nature and extent of the near-surface contamination and the excavation of selected waste sites to evaluate worker-dose and excavation-process variables. Initial work will focus on a trench where a series of direct-push technology (DPT) holes will be installed and subsequently characterized to define the nature and extent of near-surface gamma-emitting contamination. That contamination then will be excavated to evaluate process variables and worker dose. Also, excavation of a crib is anticipated to examine the remnant crib structure for its potential to contribute to future subsidence. Finally, excavation of the 216-B-53A Trench is anticipated to characterize its transuranic constituent contamination and expand experience in the disposal of soil that possesses transuranic constituent contamination. Also, additional characterization of this trench will refine its CSM. In all cases, the targeted waste site will be one expected to possess the highest inventory of near-surface contamination, to provide worst case, or bounding, information. The treatability test is expected to include four phases.

Phase 1

- A campaign of DPT holes, followed by SGL characterization of those holes, will be focused on one of the trenches that received scavenged waste. The likely trench for this investigation is the 216-B-26 Trench, because it received more Cs-137 than any other in this grouping (PNNL-15829, Inventory Data Package for Hanford Assessments), and it already has been the focus of six DPT holes and a borehole used to collect soil samples. SGL characterization of those holes showed a wide range of contamination within that trench, with the maximum Cs-137 concentration in each hole varying from essentially none to nearly 3.6 million pCi/g (Table 1). The next lowest maximum was 18,000 pCi/g. As before, the DPT holes will be characterized using SGL to estimate the Cs-137 concentration as a function of depth. The spatial distribution of the DPT holes will be used to determine the lateral extent of contamination in addition to its variability along the length of the trench. At least 25 DPT holes will be pushed to extend beyond the depth of high Cs-137 contamination (assumed to be no deeper than 7.6 m [25 ft]) and subsequently logged. The number of DPT holes and their locations will be established through the DQO process.

- The DQO process also will establish whether soil sampling is to be performed. The SGL data will define the nature and extent of the Cs-137 contamination, but will not provide direct information about colocated Sr-90. The only existing shallow soil sample was from the approximately 4.6 m (15-ft) level of the 216-B-26 Trench, indicating a ratio of Sr-90 to Cs-137 of approximately 1.8:1, which is inconsistent with the soil-inventory model that estimates 432 Ci of Sr-90 and 521 Ci of Cs-137 in the trench (PNNL-15829), unless the ratio is depth dependent. Another reason for considering soil sampling is to support development of a relationship between field dose measurements and Cs-137 (and Sr-90) concentrations. These data would be used to allow concentrations (and inventories) of these contaminants to be estimated as excavation proceeded. No contaminants of concern other than Cs-137 and Sr-90 are anticipated to be involved in Phase 1.

Phase 2

- Excavation of the near-surface contamination will be performed from the same trench that was the object of Phase 1 (assumed to be the 216-B-26 Trench). Knowing the locations and magnitude of the highly contaminated regions of the trench will assist the excavation process design. In particular, it will provide a basis for refining the worker-dose estimate and establishing whether ALARA modifications to equipment are warranted.

- The 216-B-26 Trench is divided into thirds by berms that confined discharged waste, presumably to ensure more uniform waste distribution along the length of the waste site. Table 1 displays the SGL data for the seven boreholes that were installed in that trench. Note the substantial variability in contamination levels along the length of the trench. Note in particular the substantial variation between the adjacent C4191 and C4195 boreholes.

- Excavation will be begin on a single "third" of the trench, on the premise that sufficient information may be garnered without excavating the entire length of the trench. Based on available SGL of this trench, excavation may begin with the middle third, to ensure that bounding information is obtained from the most contaminated section. Overburden will be removed and reserved as feed material for anticipated downblending of highly contaminated soil and eventual backfill material. As the region of high contamination is approached, more frequent field measurements of soil-contamination level will be performed to ensure that excavated soil will meet the ERDF waste acceptance criteria and transportation requirements. Minimizing worker dose may necessitate evaluation of remote dose-measurement capability, such as installing radiation detector(s) on the excavator bucket. Once the highly contaminated layer is exposed, it is anticipated that substantial downblending will be required, based on the high dose rate anticipated. Focus on the downblending process will evaluate its feasibility. The calculated downblending ratio for the 216-B-26 Trench highly contaminated soil is approximately 7 parts "clean" to 1 part contaminated soil (DOE/RL-2004-66) in contrast to the downblending ratio of approximately 2:1 required for the less-contaminated 116-N-1 Trench soil (BHI-01558, 116-N-1 Trench Level II ALARA Review). Also, the downblending process has been predicted to comprise a significant portion of the estimated overall remediation-worker dose (~18 percent per DOE/RL-2004-66).

- The DQO process also will establish whether soil sampling is to be performed. No contaminants of concern other than Cs-137 and Sr-90 are anticipated to be involved in Phase 2.

- As excavation of the first third of the 216-B-26 Trench nears completion, a decision will be made whether to proceed to the next section or to begin excavation of the 216-B-14 Crib (Phase 3). Input to the decision will be an assessment of all data collected compared to the objectives. If all data is not available at the time the first third of the trench has been excavated, it may be prudent to shift excavation to the 216-B-14 Crib to provide efficient utilization of the field crew rather than continue excavation of the 216-B-26 Trench. The decision will be made jointly by the EPA and the DOE Richland Operations Office (RL). Unless it is decided that sufficient information has been obtained from the 216-B-26 Trench excavation, the field crew would return to that trench to continue its excavation following data collection associated with 216-B-14 Crib excavation. The decision logic will be defined in the treatability test plan.

- A documented safety analysis in accordance with DOE-STD-1120-2005, Integration of Environment, Safety, and Health into Facility Disposition Activities, will be prepared, if necessary. The documented safety analysis would include limits to ensure worker and public safety. Because this need is not yet established, impact on the excavation process is uncertain, as is overall impact on the treatability test cost and schedule.

Phase 3

- Excavation of the near-surface contamination of a crib will be performed. At this time, it is anticipated that the 216-B-14 Crib will be the focus, because it received more Cs-137 and Sr-90 than any of the other cribs.

- Before excavation begins, a DPT/SGL investigation will be performed to assess, in a general sense, the depth and lateral spread of the contamination. The number of DPT holes is expected to be small, because the design of the cribs and the method of waste discharge (the siphon tank discharged approximately 42 m^3 [~11,000 gal.] at a time to the crib) should have resulted in uniform waste dispersal throughout the crib. Because the ratio of effluent volume to waste site area is greater for the cribs than for the trenches, the distribution of the near-surface contamination may be different than for the trenches. The DPT investigation also may provide insight on potential remnant crib-subsidence potential.

- Potential for remnant crib-structure subsidence may be difficult to assess. Some indication of void space may be possible by the DPT/SGL evaluation. The DPT/SGL evaluation should provide guidance for subsequent examination of the crib structure. For example, high Cs-137 concentrations could preclude personnel entry into the excavation.

The DQO process will address how the crib structure will be examined to determine whether future subsidence potential exists.

- Excavation of the crib would proceed in a manner similar to that for the trench. Following partial removal of the overburden, the highly contaminated layer would be carefully removed, downblending as necessary to achieve the ERDF waste acceptance criteria. Because of the width of the as-built crib excavation, the bottom being 12.2 x 12.2 m (40 by 40 ft), the excavation process may be different than for the trench, which has a bottom width of 3 m (10 ft).

- The DQO process also will establish whether soil sampling is to be performed in this phase. No contaminants of concern other than Cs-137 and Sr-90 are anticipated to be involved.

- As excavation of the 216-B-14 Crib nears completion, a decision will be made whether to begin excavation of the 216-B-53A Trench. Input to the decision will be an assessment of all data collected compared to the objectives. As before, this decision will be made jointly by the EPA and RL. The decision logic will be defined in the treatability test plan.

Phase 4

- Before excavation of the 216-B-53A Trench begins, a DPT/SGL investigation will be performed to assess the nature and extent of the expected plutonium contamination. Stoller[1] has the capability to detect 13,000 pCi/g of Pu-239 through a steel-cased hole, which is approximately 13 percent of the TRU[2] waste threshold (Henwood and McCain, 2006, "Discrimination of Radionuclides in High-Resolution Spectral Gamma Logging"). These data may be sufficient to establish the nature and extent of gross plutonium contamination in this 18.3 m (60-ft) -long trench. Also, the SGL data may allow sufficient definition of the CSM to eliminate the need for further intrusive characterization. As described above, the decision will be made jointly by the EPA and RL, with the intent to continue excavation unless sufficient information has already been collected. The DQO process will establish whether soil sampling is to be performed.

- In contrast to the other waste sites in the BC Cribs and Trenches Area, waste disposed to the 216-B-53A Trench primarily originated from the Plutonium Recycle Test Reactor upset. Thus, except for a modest quantity of uranium (31 kg per RPP-26744, Hanford Soil Inventory Model, Revision 1), essentially no mobile contaminants are associated with this waste site. The soil-inventory model estimates 1,527 kg of nitrate (RPP-26744), in contrast to approximately one million kg of nitrate disposed to many of the scavenged waste sites. This is corroborated by high-resolution resistivity characterization of this waste site, which shows no region of anomalous soil conductivity there (D&D-31659,

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[1] Stoller is a trademark of S. M. Stoller Corporation, Lafayette, Colorado.

[2] Radioactive waste as defined in DOE G 435.1-1, Implementation Guide for Use with DOE M 435.1-1.

Geophysical Investigations by High-Resolution Resistivity for the BC Cribs and Trenches Area, 2004-2006).

- Excavation will proceed as before, beginning with removal of overburden and then removal of the region containing the near-surface plutonium concentration. Because the waste discharged to this trench was basic, the plutonium is not expected to have migrated much beyond its initial contact with the soil. Methods to control transuranic constituent contamination will be evaluated, as well as its disposal.

- The DQO process also will establish whether soil sampling is to be performed. No contaminants of concern other than Pu-239/240 are anticipated to be involved in Phase 4.

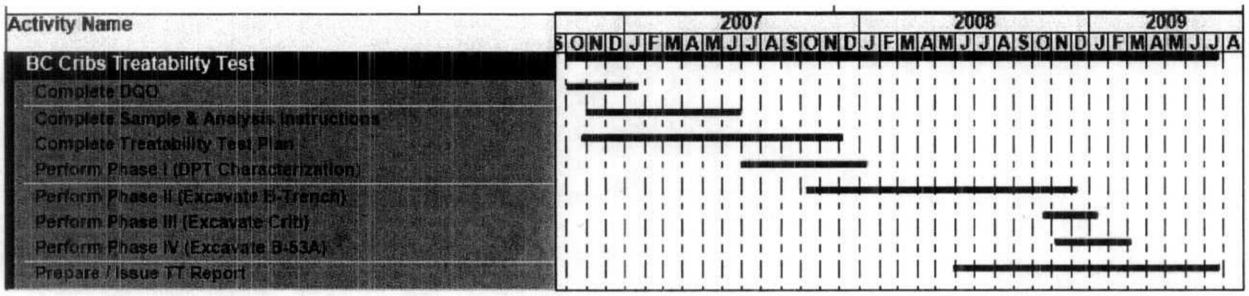
The following list summarizes how the treatability test objectives will be met by the test.

Objective	Applicable Treatability Test Phase
Obtain additional characterization data for the BC Cribs and Trenches Area waste sites to evaluate the remedial action alternative that includes removal, treatment, and disposal of contaminated near-surface soil.	1, 2, 3
Obtain data to refine cost estimates for excavation and disposal of contaminated near-surface soil.	1, 2, 3, 4
Correlate predicted dose information (obtained by modeling worker exposure using pre-excavation site characterization data) to actual dose received during conduct of the treatability study.	1, 2, 3
Refine the removal, treatment, and disposal process to ensure that the dose to workers remains as low as reasonably achievable.	2, 3, 4
Evaluate the potential for future subsidence of the remnant crib structure.	3
Evaluate the potential for the plutonium inventory associated with the 216-B-53A Trench to require special handling/disposal procedures.	4
Refine the conceptual site model for the 216-B-53A Trench	4

ADD-5.0 SCHEDULE

The treatability test is scheduled to commence early in fiscal year 2007 with a DQO process and associated sampling and analysis plan that will define data-collection requirements. Phase 1 field work is anticipated to begin in July 2007, assuming that a sampling and analysis instruction can be approved before the overall treatability test plan is approved. Figure 1 is a summary schedule for the entire treatability test.

Figure 1. Treatability Test Summary Schedule.



Following are the project milestones:

05/31/2007	Submit Treatability Test Plan to RL for subsequent transmittal to EPA
11/30/2007	Complete Phase 1, including report
07/31/2008	Complete Phase 2a, including sampling/analysis.

As discussed above, there is uncertainty regarding potential nuclear facility designation for excavation of the highly contaminated soil. If such designation is established, the schedule will be revised to accommodate the impact.

Table 1. Cesium-137 Concentration vs Depth from Gamma Logs of the 216-B-26 Trench.

Depth (ft)	Concentration of Cesium-137 in Boreholes (pCi/g)						
	C4197	C4196	C4195	C4191	C4194[a]	C4193	C4192
1	0	0	0	1	0	0	0
2	0	0	0	1	0	0	0
3	0	1	0	1	0	0	0
4	0	0	0	0	0	1	2
5	0	0	0	0	1	1	4
6	1	0	0	0	0	0	1
7	1	1	0	0	0	0	3
8	0	0	0	4	0	0	4
9	0	0	3	72	1	15	9
10	2	3	195	550	2	711	639
11	99	179	5,568	33,942	7	80,806	25,056
12	7,463	16,093	1,759,522	2,862,422	6	384,650	2,352,526
13	18,428	60,311	1,417,083	3,598,264	1	29,242	1,248,648
14	1,625	13,402	183,716	239,122	0	6,600	666,781
15	380	2,843	26,551	46,252	0	2,386	95,645
16	127	1,385	406	146,113	0	638	7,767
17	43	373	1,625	57,469	0	187	2,820
18	6	124	15,230	7,721	0	11	1,198
19	1	146	2,944	6,410	0	4	581
20	11	168	203	2,112	0	3	433
21	12	19	84	1,026	0	1	258
22	77	5	70	561	0	2	1,201
23	16	5	5,635	227	0	274	142
24	1	2	5,584	378	0	1,280	467
25	0	2	171	942	0	128	2,152
26	0	0	147	538	0	46	813
27	0	1	72	401	0	40	211
28	0	0	566	346	0	274	886
29	1	0	24	584	0	423	55
30	0	0	13	664	0	27	238
31	0	0	67	545	0	2	14
32	0	1	65	449	0	4	189
33	0	3	134	229	0	16	107
34	0	24	63	542	0	35	33
35	1	5	58	271	0	32	307
36	4	4	1,472	81	0	52	41
37	17	5	3,271	75	0	1,250	32
38	11	47	1,806	258	0	961	26
39	0	36	1,594	206	0	951	39

[a] Borehole believed to be located directly over one of the berms that divided the trench into thirds.

ADD-6.0 REFERENCES

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Henwood, P. D., and R. G. McCain, 2006, "Discrimination of Radionuclides in High-Resolution Spectral Gamma Logging," Waste Management Conference 2006 (WM '06), February 26-March 2, 2006, Tucson, Arizona.

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